

## Defining Sensitive Areas and Management Practices to Reduce Groundwater Contamination Workgroup

Workgroup Recommended Practices for Sensitive Areas - DRAFT – January 19, 2016

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### OVERVIEW

During the October 21, 2015 Defining Sensitive Areas and Management Practices to Reduce Groundwater Contamination Workgroup (Workgroup) each workgroup member was assigned a task to develop a maximum of 10 recommended management practices for sensitive areas. Sensitive Areas were defined by the workgroup during its August and September 2015 meetings



Some Examples  
to Consider...

The following sections contain prior workgroup recommendations that reached consensus as well as recommendations submitted by each workgroup members categorized by a specific topic. Each proposed recommendation has not been altered and is listed with the wording used by that specific workgroup member.

Each proposed recommendation was categorized as shown in the table of contents. However, some recommendations may also relate to other recommendations in other categories. The similarities between categories have been highlighted to provide visual correlation. This includes depth to bedrock recommendations (highlighted in yellow).

Black wording includes recommendations submitted/agreed to prior to the November 23, 2015, meeting.

Red wording added is based on November 23, 2015 workgroup discussion.

Blue wording added is based on December 15, 2015 workgroup discussion.

### WORKGROUP PARTICIPANTS

The following workgroup members submitted recommendations:

1. Davenport, Tom - EPA
2. Geers, Sarah & Kamp, Tressie – Midwest Environmental Advocates (MEA)
3. Nysse, Nathan; Debroux, Ryan; Niles, Don; & Polenske, Jeff – CCAs, Manure Hauler, & Farmer
4. Sagrillo, Mick; Utesch, Lynn; & Wallander, Andy (input from Parins, Jodi; Luft, Lee; & Swanson, Dick) – Kewaunee County Citizens
5. WDNR (Craig, Andrew; Phelps, Bill; Baeten, Joe; Holtz, Brad; Burton, Kyle; Lowndes, Mary Anne; & Rasmussen, Russ)

### RECOMMENDATIONS WITH CONSENSUS

#### *Manure Application*

1. (full consensus- Nov 23) Inspect fields according to a., b., and c. below for depth to bedrock, groundwater conduits, contributing channels or areas that drain to groundwater conduits, drain tiles that may drain/discharge to groundwater conduits and evidence of fracture traces; keep inspection logs and update NMP maps with identified features.
  - a. Inspect annual cropped fields in spring before manure application, tillage, or planting or in late summer/fall after crop harvest and before manure application, tillage, or planting.
  - b. Inspect alfalfa and perennial cropped fields in spring and summer before or 7-10 days after cutting – look for uneven crop growth that follows distinct lines.

- c. Use direct measurements (backhoe, probe, test pits, electric resistivity, etc.) to verify depth to bedrock and groundwater.
2. (full consensus – Nov 23) No mechanical applications of manure on soils with a soil depth less than 12 inches to bedrock.
3. (full consensus – Nov 23) On soils with less than 12" to bedrock, livestock may be pastured as long as the following items are met:
  - a. Pasture is maintained in adequate, perennial vegetation;
  - b. Vegetation is maintained year round;
  - c. Producer develops and maintains a grazing plan; and
  - d. The grazing plan, at a minimum, meets both NRCS Standard 590, Nutrient Management and 528, Prescribed Grazing  
<https://efotg.sc.egov.usda.gov/references/public/WI/528.pdf>
4. (full consensus – Dec 15) On soils with less than 24" to bedrock, no manure applications of liquid manure are allowed. Liquid manure is defined as having less than 12% solids content.

### *Manure Sampling*

5. (full consensus) For manure mixed with industrial waste, require chloride sampling and other applicable WPDES permit sampling requirements, as authorized under NR 214.17, Wis. Adm. Code, in addition to N, P, K.  
[http://docs.legis.wisconsin.gov/code/admin\\_code/nr/200/214.pdf](http://docs.legis.wisconsin.gov/code/admin_code/nr/200/214.pdf)

**Workgroup Discussion:** DNR agreed to consult with DNR industrial waste permit managers to verify applicable sampling requirements by industrial waste source and report this information to the workgroup. **RESULT:** the most common pollutant sampling requirements included within industrial waste WPDES permits are chlorides and TKN. See NR 214.17 (4) and (5) sections below for WPDES permit pollutant sampling requirements for land applied industrial wastes:

(4) DISCHARGE LIMITATIONS. (a) The discharge to a landspreading system may not exceed the hydraulic, organic, nitrogen, chloride or other limitations specified in the WPDES permit or plans developed pursuant to a permit requirement. In determining discharge limitations, the department shall consider the past operating performance, nutrient uptake of the cover crop, site conditions, the ability of the soils to treat the pollutants in the discharge, permeability and infiltration rate of the soil, other soil and geologic characteristics, the concentrations and characteristics of pollutants in the discharge and other relevant information.

(5) DISCHARGE MONITORING REQUIREMENTS. (a) The discharge to landspreading systems shall be monitored for total daily discharge volume.

(b) The department may require in a WPDES permit that the discharge to the system be monitored for BOD<sub>5</sub>, total suspended solids, forms of nitrogen, chloride, metals or any other pollutant that may be present. The department shall select the pollutants to be monitored and the required frequency of monitoring on a case-by-case basis by considering the potential public health impacts, probable environmental impact, soil and geologic conditions, past operating performance, concentrations and characteristics of pollutants in the discharge and other relevant information.

(c) The department may require electronic or paper submittal of discharge monitoring reports and land application forms.

6. (full consensus – Nov 23) Analyze low solids content manure for ammonia and adjust the first year available nitrogen based on the results, per UW A2809, Nutrient Application Guidelines, Chapter 9, page 73, Table 9.1 - <http://corn.agronomy.wisc.edu/Management/pdfs/A2809.pdf>

### *Nutrient Management Planning*

7. (full consensus- Sept 22) All nutrient sources and not just manure should be considered.

### OTHER TOPICS

In addition to 10 recommended management practices each member could also submit additional topics that may be discussed at future meetings. These additional topics and further discussion may lead to additional recommended management practices.

8. (workgroup – full consensus – Sept 22) Depressional groundwater recharge areas need a clear definition; specifically the workgroup needs to define the term 'shallow'.
9. (workgroup – full consensus- Sept 22) The workgroup needs to focus on winter spreading plan requirements (to address manure applications on soils > 20 feet to rock during winter – frozen or snow covered soils)
10. (workgroup – full consensus – Sept 22) Practices need to reflect manure type and not farm size. Manure characteristics (e.g., solids, nutrient and pathogen content) help better define groundwater contamination risk(s) and should be a primary criterion for practice recommendations.

## RECOMMENDATIONS PROPOSED

### *Audits & Review*

11. (Sagrillo) Establish protocol for 3<sup>rd</sup> party audits of nutrient content of manure storage and soil,

### *Cropping*

12. (Geers) CAFO NMPs should not rely on getting rid of all or most of manure on corn fields in the fall. CAFOs should diversify crop fields and time of planned applications.

### *Depth to Bedrock/Groundwater*

13. (WDNR) Soil depth to bedrock and groundwater:
  - a. No manure application on soils <3 feet to bedrock and groundwater and implement c. below
  - b. No untreated liquid manure application on soils <4 feet to bedrock and groundwater and implement c. below
  - c. When applying manure on soils > 3 feet (or > 4 feet for untreated liquid manure) to bedrock or groundwater and as weather and soil conditions allow:
    - i. Complete pre-tillage or immediately incorporate manure (except for established alfalfa or other established crops
    - ii. No injection unless pre-tillage completed
    - iii. Limit application rate to < 10,000 gal/acre/application
14. (Davenport-EPA) No manure spreading on soils with less than two feet to limiting depth or bedrock. (We are not pushing for the 3 feet depth as identified for other activities like septic because manure application is limited by being tied to agronomic rates).

**Workgroup Discussion – Nov 23:** The workgroup began to contrast/compare and discuss similar recommendations related to prohibiting manure applications based upon bedrock depth (i.e., 10, 16, 17, and 25-28). The workgroup agreed a spatial analysis showing the impact from prohibiting waste spreading based upon bedrock depth would be helpful for workgroup discussion and consensus. Specifically, how many acres and which areas/fields would be restricted at various bedrock depths (i.e., 2, 3 and 5 feet)?

There are two spatial layers available from DATCP that show soils with bedrock at 0-20 inches (590 - R soils) and at 0-24 inches (CAFO – R soils). Kewaunee County has spatially mapped

approximately 80% of all agricultural acres in the county (because they have a NMP). Combining these two spatial layers can help determine/show impacts from a 20 and 24 inch waste application prohibition. The NRCS Web Soil Survey can also be used to determine bedrock depth impacts for an entire county or for smaller areas (as defined by user).

**Workgroup Discussion – Dec 15:** The workgroup began to discuss options for applying liquid manure on soils with depths to bedrock ranging from 24" to 36". The proposed practices when applying to these soils included application to growing crop, treatment/pathogen reduction to levels documented in NR 204, timing of application, require certain tillage practices (pre-tillage), reduced application rate (8,000 gallons per acre was proposed), and no spreading in spring or fall. Practices for application of solid manure were not discussed.

### *Groundwater Conduits*

15. (Sagrillo) Adopt Karst Task Force #3, Setbacks and Land Draining to Sinkholes, Closed Depressions, or Bedrock Openings in its entirety. (see appendix)
16. (WDNR) Permanently mark identified GW conduits (sinkholes, other identified bedrock features) and drain tiles within/adjacent to field AND implement the following:
  - d. Install a 5 foot vegetated buffer around the feature(s).
  - e. The feature(s) and 5 foot buffer should not be tilled, planted, or receive nutrients.
17. (WDNR) No manure application within:
  - f. 1,000 feet of public "community" water supply wells
  - g. 250 feet of private potable and public "non-community" water supply wells
  - h. 100 feet of all other "direct conduits to groundwater"
  - i. 100 feet of defined channels and concentrated flow paths that lead to a, b, or c.
18. (Nysee) 100' well setback.
19. (Nysee) 100' conduit setback (groundwater & surface water).

*Manure Application*

20. (Geers) DNR should include all applicable provisions of NR 214.20 and NR 214 in WPDES permits that authorize manure irrigation.
21. (Geers) Adopt Karst Report recommendation to reduce spreading rates on sensitive areas:
  - j. In "highly sensitive" areas:
    - i. No liquid manure may be applied in areas with less than 5 feet to bedrock;
    - ii. Liquid manure rate limited to 6,000 gal/acre/year (NOTE: Bill Schuester also made this recommendation in comments on the 590 standard revisions);
    - iii. Commercial fertilizer applied at the same rate as alfalfa; and
    - iv. No emergency spreading or headland stacking approvals.
22. (Sagrillo) Accept recommendation of Karst Task Force to reduce spread on 'sensitive areas':
  - k. In Sensitive areas:
    - i. Liquid manure limited to 12,000 gal/acre/year or per NMP, whichever is lower
    - ii. Winter prohibition on frozen or snow covered groundwater or between Jan 1 – Apr 15
    - iii. No spreading of liquid manure within 24 hours before, during or after rainfall with potential for runoff (using DATCP Advisory system)
  - l. In Highly Sensitive areas (all of sensitive areas recommendations above and):
    - i. No liquid manure in areas of less than 5' depth to bedrock.
    - ii. Liquid manure limited to 6,000 gal/acre/year (also recommended by Bill Schuster in 590 comments)
    - iii. Commercial fertilizers applied at same rate as alfalfa
    - iv. No lands within highly sensitive area approved for emergency spreading or headland stacking
23. (Sagrillo) Accept recommendation that all applications of liquid manure in sensitive areas be immediately incorporated at a depth of 8 inches or less on harvested fields.
24. (Sagrillo) Adopt Karst Task Force #4, Requirements for Persons or Conduct Applications of Animal Wastes in Shallow Carbonate Bedrock (<50") Areas its entirety. (see appendix)



25. (Sagrillo) No application of any waste in closed depressions after fall harvest of crops.
26. (WDNR) No surface application\* on slopes greater than 6% unless spread material immediately incorporated or injected; no surface application on slopes greater than 12%  
\*=does not apply to perennial forage crop(s)
27. (WDNR) Liquid manure should be applied during the growing season or within 10 days of crop establishment and as split applications (not to exceed 10,000 gallons per acre per event) throughout the season. Liquid manure applications during the fall should be avoided as much as possible.
28. (WDNR) No manure application when a rain event of 1 inch or greater is forecast within the next 24 hours.
29. (Davenport) We encourage the timing limitations to be more stringent. Farms shouldn't be applying manure to fields if there is >0.25-0.5 inch rainfall within the 24 hrs forecast.
30. (Nysee) Soil depth 12-24":
  - m. 590 solid manure
    - i. Allow solid applications
    - ii. Solid manure surface applied and incorp within 72 hours
  - n. 590 liquid manure
    - i. Limited applications with treated manure\* sources
    - ii. Treated manure\* : surface applications 3-7000 gpa on growing crop with sun exposure
    - iii. Maintain greater well and conduit setbacks
  - o. 243 solid manure
    - i. Allow solid applications
    - ii. Solid manure surface applied and incorp within 48 hours. Reduced rates allowed to maintain soil OM%. Rates limited to 15 ton/ac
  - p. 243 liquid manure
    - i. Limited applications with treated manure\* sources
    - ii. Treated manure\*: surface applications 3-7000 gpa on growing crop with sun exposure.
    - iii. Maintain greater well and conduit setbacks

\*Treated Manure Examples: UV light treated, Digested manure, wash water, ultra low percentage manure or bacteria reduced manure.

31. (Nysee) 24-60":

- q. 590 solid manure
  - i. Allow solid applications based on agronomic rates.
  - ii. Incorp within 72 hours
- r. 590 liquid manure
  - i. Allow liquid applications based on agronomic rates or manure analysis using 2 of the following 5 items:
    - 1. Use N stabilizer.
    - 2. Use pre tillage.
    - 3. Cover crops to manage nitrogen if conditions allow.
    - 4. Reduce rate if soil OM is below 2.0% OM.
    - 5. If less than 2% OM use a split application to apply nutrients.
- s. 243 solid manure
  - i. Allow solid applications based on agronomic rates.
  - ii. Incorp within 72 hours
- t. 243 liquid manure
  - i. Allow liquid applications based on agronomic rates or manure analysis using 2 of the following 5 items:
    - 1. Use N stabilizer.
    - 2. Use pre tillage.
    - 3. Cover crops to manage nitrogen if conditions allow.
    - 4. Reduce rate if soil OM is below 2.0% OM.
    - 5. If less than 2% OM use a split application to apply nutrients.

32. (Nysse) 60" and greater:

- u. 590 solid manure
  - i. Allow solid applications based on agronomic rates.
  - ii. Surface or incorp
- v. 590 liquid manure
  - i. Allow liquid applications based on agronomic rates or manure analysis
- w. 243 solid manure
  - i. Allow solid applications based on agronomic rates
  - ii. Surface or incorp
- x. 243 liquid manure
  - i. Allow liquid applications based on agronomic rates or manure analysis

### *Manure Storage & Management*

33. (Geers) CAFOs should develop more than 180 days of storage given the difficulty acknowledged with calculating volume needed for 180 days, including fluctuating animal populations, and the difficulty of anticipating the number of days in the spring and fall during which CAFOs can landspread due to unknown weather and crop challenges.
34. (Geers) Help small animal feeding operations develop appropriate storage through cost sharing instead of making it easier for small AFOs to store manure at large CAFOs.
35. (WDNR) All manure receives recognized pathogen reduction treatment process prior to land application.

**Workgroup Discussion – Dec 15:** workgroup discussed using composting for solid manure as well as various treatment technologies for liquid manure. NR 204 describes pathogen treatment process for biosolids and other wastes and should be considered.

### *Nutrient Management Planning*

36. (Geers) NMPs should be based on nutrient balance assessments to ensure ground and surface water quality standards won't be violated due to discharges. SnapPlus rates are based on optimum crop yield, not nutrient balance assessments. This should be done on a field-by-field basis before a new field is added to a CAFO NMP, or when WPDES permit is issued/renewed.
37. (Sagrillo) Develop land/AU spreading ratio for Sensitive areas of two acres to one AU (Joel Kitchens recommended a ratio of cows to acreage).
38. (Sagrillo) Require signed, written, land contracts/agreements for rented acreage that cover remaining duration of WPDES permit (e.g. a five year contract for a five year permit or a 3 year contract if permit terminated in 3 years).
39. (Sagrillo) Recommend annual soil testing of all fields. Use test as basis for an agronomic rate that maintains or improves soil's nutrient and biological health.
40. (WDNR) All livestock operations that land apply manure prepare and implement a NM plan that reflects, at a minimum, the proposed NRCS 590 standard.

41. (WDNR) Develop and implement a plan for emergency\* liquid waste applications (as defined in NR 243) on frozen and snow covered soils that are > 20 feet to bedrock depth using proposed NRCS 590 winter spreading criteria and the following requirements:
  - y. Notify Land Conservation Department and DNR (CAFO farms only) prior to application
  - z. 200 foot setbacks from identified channels that lead/discharge to GW conduits or GW recharge areas
  - aa. Evaluate and rank fields for low, medium and high risk emergency applications based upon criteria i-iv. below; low risk fields are first priority for application.
    - i. % of restricted area within field from setback, slope and bedrock depth restrictions
    - ii. Number of identified karst features within or immediately adjacent to field
    - iii. % field area with identified fracture traces
    - iv. Number of channel(s) in field that lead to identified groundwater conduits or recharge areas within or adjacent to field

\*=recommendation presumes 180 days available storage capacity

42. (Davenport-EPA ) Bio-physical restrictions apply to all operations regardless of size.

#### *Funding*

43. (Geers) EPA should provide additional funding for the Borchardt study so that it can produce more robust data on the source of the groundwater pollution.
44. (Sagrillo) Work with NRCS to reprioritize EQUIP monies to elevate practices that protect groundwater and surface waters.

#### *Sensitive Areas*

45. (Geers) Recommendations for "Areas Susceptible to Groundwater Contamination" document:
  - bb. Adopt the Karst Report recommendations for defining sensitive areas based on depth to bedrock:
    - i. Under 20 feet – highly sensitive
    - ii. Between 21-50 feet – sensitive
  - cc. Categorize the following as "highly sensitive":

- i. Any areas that the DNR designates as an "area of special concern" under the well compensation program;
    - ii. SWQMA
  - dd. Sensitive areas may be less susceptible to groundwater contamination if the farmers commit to practices such as pasture raising cows, crop rotation, cover crops, keeping and spreading manure in solid form when possible, etc.
46. (Sagrillo) Accept definition of 'sensitive areas' as defined in Karst Task Report aka 'Water Quality Management Area'. Further define:
- ee. Under 20' – 'Highly Sensitive'
  - ff. 21-50' – 'Sensitive'
  - gg. Add any areas that have been deemed 'areas of special concern' by DNR
  - hh. Add lands within 1.5 miles of above in recognition that impact to groundwater moves outside of soil depth boundaries
  - ii. All SWQMA areas considered 'highly sensitive'

#### *Surface Waters*

- 47. (Geers) Expand vegetative buffers around surface waters, especially on fragile or quick-draining soils.
- 48. (Sagrillo) Consider surface waters (aka 'Waters of the State' or navigable waters) the same as concentrated flow channel or direct conduit to groundwater.
- 49. (Sagrillo) Increase setback for spreading of all manures to 100' of waters of the state.
- 50. (Nysee) 25' incorporated/inject, 100' surface setback for perennial waterways.
- 51. (Nysee) 25' setback for wetlands.

#### *Tile*

- 52. (Geers) Require lateral termination of all subsurface field drain tiles within 100 feet of waters of the state, conduits to groundwater, and concentrated flow channels (NOTE: NRCS recommendation).

53. (Geers) Operators should locate all tile lines in advance of obtaining permission to spread on a proposed field. Aerial technology should help.
54. (Sagrillo) Require lateral termination of subsurface field drain tile at a minimum of 100' to Waters of the State, conduits to groundwater, concentrated channels and the like (NRCS recommendation)

#### OTHER TOPICS

In addition to 10 recommended management practices each member could also submit additional topics that may be discussed at future meetings. These additional topics and further discussion may lead to additional recommended management practices. The other topics previously agreed to or submitted for discussion include the following:

55. (Geers) Discuss feasibility of CAFOs installing some of the treatment methods used at wastewater treatment plants identified in Heidi's presentation. Primarily treatment to remove solids and spread separately from liquid waste? Secondary treatment?
56. (Geers) Further discuss tradeoffs with recommended practices such as limiting applications on shallow soils, crop rotation, cover crops, etc.
57. (Geers) Discuss petitioner comments on areas susceptible to groundwater contamination document. (see attached June 8, 2015, petitioner letter to DNR)
  - a. Will this be formal guidance?
  - b. Are there certain areas to designate as susceptible to groundwater contamination such as those with less than 20 feet depth to bedrock? Including a bright-line where feasible adds clarity and consistency.
  - c. Are current standards sufficient for sandy, well-drained soils?
58. (Geers) Can we invite someone with information on soil health to present? There are some experts at UW-Madison.
59. (Geers) Discuss how to conform SnapPlus or other tools to account for water quality standards for both N and P, so that applications are not just based on optimum crop yield.
60. (Geers) Consider requiring NMPs for chemical fertilizer applications on ALL fields, not just when a CAFO is using a field.
61. (Geers) Discuss how to better assess the transport of nutrients to surface water through groundwater, including through tile lines and natural transport pathways.

62. (Sagrillo) Looking beyond the next one to two years, we need to develop whole system recommendations now that would include manure handling systems, manure management, crop rotation, etc.
63. (Sagrillo) Also, for longer term solutions begin work on new BMPs that implement the Karst Taskforce recommendations.
64. (Sagrillo) We recommend to the Alternative Technologies Group that resources be tasked to 'get the water out' of liquid manure (Karst recommendations page 17: 'reduce water use in manure systems to create more solid manure.').

## Appendix

### Page 9, Final Report of the Northeast Wisconsin Karst Task Report (2007-02-09)

#### 3. Setbacks and Land Draining to Sinkholes, Closed Depressions or Bedrock Openings (includes losing streams on carbonate bedrock)

- a. There is a high probability of groundwater contamination when manure is applied to land areas within closed depressions and within drainage areas that contribute runoff to sinkholes or bedrock openings (Criteria 1).
- b. Land areas near channels and concentrated flow paths that deliver runoff to closed depressions, sinkholes and bedrock openings are the most critical to the quality of runoff water.
- c. No runoff or concentrated flow of liquid wastes.

#### RECOMMENDATIONS:

#	Hazard/Sensitive Feature	Limitation	Exceptions/comments
1	Sinkholes, bedrock openings, surface inlets, and areas of focused infiltration within closed depressions	No applications of wastes within 100 feet.	None
2	Delivery system * to sinkholes, bedrock openings, surface inlets, and areas of focused infiltration within closed depressions.	No application of wastes within 100 feet.	None
3	Closed depressions, regardless of soil depth.	Incorporation of all wastes immediately after application.	None

\* Delivery system is a defined channel or concentrated flow path.

#### 4. Requirements for Persons Who Plan or Conduct Applications of Animal Wastes in Shallow Carbonate Bedrock (<50 ft) Areas

#### RECOMMENDATIONS:

Hazard/Sensitive Feature	Limitation	Exceptions/comments
Areas with less than 50 feet of soil to carbonate bedrock (Categories 1, 2 and 3)	Require field investigations to identify and map closed depressions, sinkholes, bedrock openings, bedrock outcrops, surface inlets, and areas of focused infiltration within closed depressions and drainage areas to these features (Figure 5) during nutrient management planning	None
	Require a spill response plan for waste storage, transport, and applications.	None
	Require training on karst topography, spill response planning, and field identification of the above sensitive features.	None